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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Dent

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Docket No.: 4015-981

Title: COMMUNICATIONS SYSTEM EMPLOYING NON-POLLUTING PILOT CODES

Examiner: Mr. Willie J. Daniel Jr.

Group Art Unit: 2686

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Amy J. Martin

APPEAL BRIEF

I. REAL PARTY IN INTEREST

The real party in interest is Telefonaktiebolaget L.M. Ericsson.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences to the best of Applicant's knowledge.

III. STATUS OF CLAIMS

Claims 1-29 stand pending in the application, with claims 10-20 allowed and claims 1-9 and 21-29 rejected. Applicant appeals the rejection of claims 1-9 and 21-29.

IV. STATUS OF AMENDMENTS

All amendments have been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 outlines a method of jointly transmitting information signals and dummy signals from some number of transmitters to a lesser number of receivers. The receivers return loop back signals having dummy signal interference in them, where the amount of dummy signal interference is dependent on the accuracy of the propagation channel estimates used to pre-filter the jointly transmitted information and dummy signals. The propagation channel estimates are therefore revised based on the loop back signal, i.e., revised as a function of observing dummy signal interference in the loop back signals. See, for example, the application at p. 4, lines 3-20, and at p. 17, lines 6-14.

Independent claim 21 claims a wireless communication network that includes transmitters supporting joint transmission of the information signals and dummy signals, a loop back signal processor to determine dummy signal interference in the loop back signals, and a transmit processor to form the information signals and dummy signals with pre-filtering, and to adjust that pre-filtering responsive to the interference determined by the loop back processor. See, for example, the application at p. 15, lines 14-26, and Fig. 3, which illustrates a transmit processor 18 generating transmit signals, including information signals and dummy pilot signals, and a loop back signal processor 52 determining dummy pilot signal interference in a composite loop back signal from a receiver (mobile station 16), based on correlating the information signal and the composite loop back signal. Independent claim 29 essentially mirrors the elements of claim 21, but it is cast as a "system" claim, rather than as a network claim.

Thus, as a general view, the claims involve estimating the downlink propagation channels between individual ones in a set of transmitters and individual ones in a lesser-numbered set of receivers. Each receiver provides feedback information for downlink channel estimation, but the transmitters have incomplete knowledge of the downlink propagation channels to the extent that the transmitters outnumber the receivers—i.e., there is not enough receiver feedback for complete determination of the propagation channels. The present

invention as claimed solves this problem by imagining the existence of one or more "dummy receivers" at spatial locations where the propagation channel coefficients are orthogonal to the propagation channel coefficients of the real (physically existent) receivers. See, for example, the application at p. 4, lines 3-20.

The upshot of the methods and apparatus of the claims under appeal is that the dummy (pilot) signals are formed using the transmitters' current propagation channel estimates for the real receivers in such a way that they cause interference in loop back signals from the receivers to the extent that the channel estimates are inaccurate. Thus, a network entity associated with the transmitters can revise the propagation channel estimates as a function of the amount of dummy pilot signal interference appearing in the receiver loop back signals—see p. 17, lines 1-14, of the application, for example.

VI. GROUNDS OF REJECTION

A. Rejection of claims 1-5, 7-9, 21, and 23-29 under 35 U.S.C. § 102(b)

The examiner rejects claims 1-5, 7-9, 21, and 23-29 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,067,324 to Harrison (hereinafter "Harrison").

B. Rejection of claims 6 and 22 under 35 U.S.C. § 103(a)

The examiner rejects claims 6 and 22 under 35 U.S.C. § 103(a) as being obvious over Harrison, in view of U.S. Patent No. 6,144,711 to Raleigh et al. (hereinafter "Raleigh").

VII. ARGUMENT

A. The law of claim construction, anticipation, and obviousness.

1. The law of claim construction.

Patent examination guidelines direct examiners to give claim terms their broadest reasonable construction. MPEP, § 2111. Whether a claim term has been given its broadest reasonable construction during examination is a question of law. In re Baker Hughes Inc., 215 F.3d 1297, 55 USPQ2d 1149 (Fed. Cir. 2000). According to the appropriate legal standard, the

claim term interpretation adopted by the Patent and Trademark Office for examination "must be consistent with the one that those skilled in the art would reach." In re Cortright, 165 F.3d 1353, 49 USPQ2d 1464 (Fed. Cir. 1999).

Further, the broadest reasonable interpretation given to a claim term by an examiner must be consistent with the specification. In re Hyatt, 211 F.3d 1367, 54 USPQ2d 1664 (Fed. Cir. 2000). More particularly, the examiner must interpret claims "in view of the specification," but should not unnecessarily import limitations from the specification into the claims. Altiris Inc. v. Symantec Corp., 318 F.3d 1363, 65 USPQ2d 1865 (Fed. Cir. 2003).

2. The law of anticipation.

The first step of any anticipation analysis is claim construction, and the second step involves comparing the properly construed claim to the prior art. Helifix Ltd. v. Vlok-Lok, Ltd., 208 F.3d 13339, 54 USPQ2d 1299 (Fed. Cir. 2000). As for the first step, claim construction during prosecution necessarily differs from judicial claim construction in that examiners must give claim terms their broadest reasonable interpretation. MPEP, § 2111. Nonetheless, examiners must construe the claim terms consistent with the meanings that one skilled in the art would assign. Cortright, 165 F.3d 1353. Examiners are further obligated to construe claim terms consistent with the specification. Hyatt, 211 F.3d 1367.

As for the second step of comparing the properly construed claim to the prior art, a finding of anticipation under 35 U.S.C. § 102 is proper only if the cited reference discloses each and every limitation of the claimed invention, is enabling, and describes the claimed invention sufficiently to have placed it into the possession of one of ordinary skill in the art. In re Paulson, 30 F.3d 1475, 31 USPQ2d 1671 (Fed. Cir. 1994). More succinctly, the law of anticipation requires that the allegedly anticipating reference disclose each and every limitation of the claimed invention. Moba, B.V. v. Daimond Automation, Inc., 235 F.3d 1305, 66 USPQ2d 1429 (Fed. Cir. 2003). See, also, In re Bond, 910 F.2d 931, 15 USPQ2d 1566 (Fed. Cir. 1990)

(stating that a prior art reference anticipates the claim in question only if every element of the claimed invention is identically shown in the reference in the same arrangement as claimed).

Evaluation of whether the reference in question discloses each and every limitation of the claimed invention considers both the explicit and inherent teachings of the reference. Put simply, a reference may expressly or inherently disclose the claimed invention. Rowe v. Dror, 112 F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Whether the reference inherently discloses a feature of the claimed invention is a factual question. To that end, evidence may be introduced on the factual issue of whether a claim limitation is inherent in a prior art reference. Continental Can Co. USA v. Monsanto Co., 948 F.2d 1264, 20 USPQ2d 1746 (Fed.Cir.1991).

Indeed, claim anticipation as a whole is a question of fact. In re Berger, 279 F.3d 975, 61 U.S.P.Q.2d 1523 (Fed. Cir. 2002). A factual finding of anticipation by the Board of Patent Appeals and Interferences is judicially reviewed for substantial evidence. In re Gartside, 203 F.3d 1305, 1315, 53 USPQ2d 1769, 1776 (Fed. Cir. 2000). Thus, the reviewing court examines the factual record developed by the Patent and Trademark Office (PTO) during examination and appeal of the patent application in question to determine whether substantial evidence supports the finding of anticipation.

Substantial evidence is "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." In re Zurko, 258 F.3d 1379, 59 U.S.P.Q.2d 1693 (Fed. Cir. 2001) (quoting Consol. Edison Co. v. NLRB, 305 U.S. 197, 229, 59 S.Ct. 206, 83 L.Ed. 126 (1938)). In terms of developing a factual record during examination supporting the finding of anticipation, the PTO generally must show a sound basis for believing that the claimed invention is the same as the prior art and, upon such a showing, the burden shifts to the applicant to show they are not the same. In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). That is, the applicant rebuts the prima facie case of anticipation by submitting evidence showing that the prior art is not the same as the claimed invention.

3. The law of obviousness.

As explained in Section 2142 of the MPEP, the examiner bears the initial burden of making out a prima facie case of obviousness under 35 U.S.C. § 103. Establishing the prima facie case depends on meeting three basic criteria: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP, § 2142.

The prior art relied upon by the examiner in advancing an obviousness rejection must teach or suggest the claimed combination and a reasonable expectation of success with regard to making the claimed combination, and it is legally impermissible for the examiner to rely on the applicant's disclosure for such teachings. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). More specifically, the examiner bears the burden of presenting a convincing line of reasoning as to why the skilled artisan would have found the claimed invention obvious in light of the teachings of the references. Ex parte Clapp, 227 USPQ 972 (Bd. Pat. App. & Inter. 1985).

Ultimately, whether an invention is obvious over the prior art is a question of law, supported by an underlying factual analysis. In re Berg, 320 F.3d 1310, 65 USPQ2d 2003 (Fed. Cir. 2003). More significantly, with respect to the examiner's obviousness rejection, the determination of whether there is a motivation or suggestion to combine references is a factual question based on specific findings. Gartside, 203 F.3d 1305. On that point, the substantive question is whether one of ordinary skill in the art would have been motivated to combine the references in question. Winner International Royalty Corp. v. Wang, 202 F.3d 1340, 53 USPQ2d 1580 (Fed. Cir. 2000).

B. The factual record does not support the claim rejections

1. Harrison does not jointly transmit channel impulse responses.

All of the examiner's claim rejections (anticipation and obviousness) depend on the factual accuracy of his assertion that Harrison teaches jointly transmitting channel impulse responses, because he uses that assertion to argue that Harrison anticipates the limitation of jointly transmitting information signals, as appearing in the independent claims under appeal. Harrison's plain teachings contradict the examiner's assertion, and the Board should reverse all claim rejections on this point alone.

Specifically, at p. 3, ¶ 4, of the Final Office Action, the examiner asserts that Harrison teaches transmitting channel impulse responses from transmitters to subscriber units. First, one skilled in the art will immediately appreciate that channel impulse responses cannot be transmitted at all; rather, channel impulse responses the physical properties of a radio propagation channel, i.e., the phase, attenuation, and fading characteristics of a radio channel. Advancing the nonsensical argument that Harrison somehow teaches jointly transmitting channel impulse responses evidences a complete lack of technical understanding by the examiner, and represents a profound mischaracterization of Harrison.

Harrison discloses a base transceiver 300 transmitting weighted traffic channel signals—also referred to as communication signals—to individual subscriber units 200, from an adaptive antenna array 302. Harrison, Abstract; col. 3, lines 31-41; Fig. 1, blocks 112, 120; and Fig. 5. Harrison adaptively weights the traffic channel signals being transmitted from the adaptive antenna array in a manner that increases signal gain at the subscriber unit locations. Harrison, col. 3, lines 13-17.

To that end, Harrison transmits a unique (different) element pilot signal from each element of the base transceiver's adaptive antenna array. Harrison, col. 2, lines 41-64; col. 2, line 65 – col. 3, line 10. Because each element pilot is uniquely discernable by the subscriber units 200, each subscriber unit 200 is able to estimate the channel impulse response for the

radio propagation channel extending to it from each element of the adaptive antenna array 302. Harrison, col. 2, line 65 – col. 3, line 10.

Harrison then teaches that a "composite channel" estimate may be mathematically derived from the individual (element pilot) channel impulse response estimates, and it refers to the process of building the composite channel estimate as "pilot synthesis." Harrison, col. 3, line 38 – col. 4, line 29. Harrison's plain and unambiguous language thus teaches that a "synthesized pilot" is calculated by (or for) each subscriber unit 200, based on the individual channel impulse responses estimated from the individual element pilots received by that subscriber unit 200. Specifically, Harrison teaches that each subscriber unit 200 calculates a synthesized pilot using pilot synthesis weights that are calculated to maximize the gain of the traffic channel signal being transmitted for that subscriber unit 200 from the adaptive antenna array 302. Harrison, col. 3, line 45-52.

Harrison also notes the equivalent alternative, wherein each subscriber unit 200 returns information related to the individual (per-element) channel estimates made by that subscriber unit 200 for the element pilots, and the base transceiver unit 300 performs pilot synthesis—i.e., the base transceiver 300 carries out pilot synthesis for each subscriber unit 200, rather than burdening the subscriber units 200 with such calculations. Harrison, col. 3, lines 35-42.

Thus, in one embodiment of Harrison, each subscriber unit 200 calculates its own "synthesized pilot" and transmits corresponding synthesis weights (or related information) back to the base transceiver 300. This operation is not the transmission of a synthesized pilot, but rather the transmission of channel impulse response estimates or values mathematically derived from such estimates. Harrison, col. 5, line 1 – col. 6, line 29.

In the only other embodiment of pilot synthesis disclosed in Harrison, the subscriber units 200 return information related to the individual (per element) channel impulse responses, and the base transceiver 300 mathematically derives pilot synthesis weights—i.e., it performs the same calculations that each subscriber unit 200 performed in the other embodiment.

Harrison, col. 6, lines 37-64; and col. 3, lines 20-27. Thus, Harrison's alternative embodiment explicitly describes a method wherein subscriber units 200 feed back per-element channel impulse response information (e.g., vectorized individual channel impulse response estimates, related traffic signal error rates, etc.) to the base transceiver 300, for its internal, mathematical derivation of a pilot synthesis weight, referred to as a "synthesized pilot."

The examiner refers to several sections of Harrison—i.e., col. 2, line 65 – col. 3, line 27; and Figs. 1-3, and 5—for the proposition that Harrison teaches the joint transmission of channel impulse responses to subscriber units 200 from the adaptive antenna array's individual antenna elements. None of the sections referred to by Harrison have anything to do with supporting his proposition, nor can support for the proposition be found anywhere else in Harrison.

2. Harrison does not jointly transmit a pre-filtered dummy signal.

All of the examiner's claim rejections (anticipation and obviousness) depend on the factual accuracy of his assertion that Harrison teaches pre-filtering its synthesized pilot using propagation channel estimates, and then jointly transmitting the synthesized pilot, because he uses that assertion to argue that Harrison anticipates the limitation of jointly transmitting a pre-filtered dummy (pilot) signal, as appearing in the independent claims under appeal. Harrison's plain teachings contradict the examiner's assertion that Harrison teaches jointly transmitting any dummy signals, and the Board should reverse all claim rejections on this point alone.

Specifically, at p. 4, ¶ 1, p. 6, ¶ 5, and at p. 9, ¶ 3, of the Final Office Action, the examiner repeatedly asserts that Harrison's "synthesized pilot" is the same as the "dummy signal" transmission limitations of claims 1, 21, and 29. (Note that claims 1 and 29 include a jointly transmitted "dummy pilot signal," while claim 21 includes the equivalent jointly transmitted "dummy signal.").

As explained above, the synthesized pilot of Harrison is not a transmitted signal at all. In one instance, each subscriber unit 200 receives a unique element pilot signal from each element of the adaptive antenna array 302, computes corresponding per-element channel

impulse response vectors, and mathematically synthesizes a pilot, representing a "composite" of the individual channel impulse responses. Harrison, col. 3, line 1 – col. 4, line 29; Fig. 1, blocks 102-112; Fig. 2; and Fig. 3. The synthesized pilot definitively is not transmitted to the subscriber units 200 (jointly or otherwise) from the antenna array 302 (or anything else).

In another instance, each subscriber unit 200 returns per-element channel impulse response vectors, or related information, to the base transceiver 300, and the base transceiver 300 mathematically derives a synthesized pilot for each receiver. Harrison at col. 6, line 37 – col. 7, line 19; and Fig. 5.

It is beyond argument that Harrison does not teach the joint transmission, or any transmission of Harrison's disclosed synthesized pilot. Further, it is wholly unclear how or why the examiner alleges that Harrison teaches pre-filtering its synthesized pilot before the alleged joint transmission of it. For example, the examiner refers to Harrison at col. 4, lines 14-29, and to Fig. 1, for the proposition that Harrison teaches pre-filtering its synthesized pilot before jointly transmitting it. The sections referred to by the examiner are devoid of any such teaching, or even the suggestion of such a teaching.

Harrison teaches the transmission of individual element pilot signals from respective antenna elements in an antenna array 302, where these element pilots expressly are not pre-filtered—see Fig. 5 of Harrison and the corresponding text at col. 7—which makes clear that the individual (non-dummy, non-joint) element pilots do not pass through the adaptive weighting filters 304 shown in Fig. 5. As a point of technical order, pre-filtering the element pilots of Harrison would render them useless because the individual subscriber units 200 would not be able to discern propagation channel effects from pre-filtering errors, and thus would be unable to estimate the individual channel impulse responses for the adaptive antenna array, which is at the technical heart of Harrison.

3. Harrison does not determine dummy signal interference.

All of the examiner's claim rejections (anticipation and obviousness) depend on the factual accuracy of his assertion that Harrison teaches determining dummy signal interference for adjusting propagation channel estimates because he uses that assertion to argue that Harrison anticipates the dummy signal interference limitations appearing in the independent claims under appeal. Harrison's plain teachings contradict the examiner's assertion that Harrison teaches the use of a dummy signal of any kind, much less teaches determining dummy signal interference, and the Board should reverse all claim rejections on this point alone.

Specifically, at p. 4, ¶ 2, p. 7, ¶ 2, and at p. 9, ¶ ¶ 2, 3, of the Final Office Action, the examiner repeatedly asserts that Harrison receives loop back signals from the subscriber units of Harrison, and uses those signals to determine dummy signal interference. Not a single sentence of Harrison, and particularly not any section of Harrison cited by the examiner, makes any reference to dummy signals, the concept of dummy signals, or the determination of loop back signal interference arising from the transmission of dummy signals.

4. Harrison does not adjust propagation channel estimates based on dummy signal interference.

All of the examiner's claim rejections (anticipation and obviousness) depend on the factual accuracy of his assertion that Harrison teaches adjusting propagation channel estimates determining dummy signal interference, because he uses that assertion to argue that Harrison anticipates the propagation channel estimate adjustment limitations appearing in the independent claims under appeal. Harrison's plain teachings contradict the examiner's assertion that Harrison teaches any such adjustment, and the Board should reverse all claim rejections on this point alone.

Specifically, at p. 4, ¶ 3, p. 7, ¶ 3, and at p. 9, ¶ 4, of the Final Office Action, the examiner repeatedly asserts that Harrison adjusts propagation channel estimates based on determining dummy signal interference. Harrison does not teach the use or transmission of

dummy signals of any kind, and it is axiomatic that it cannot teach adjusting propagation channel estimates based on dummy signal interference.

The examiner's rejections amount to no more than citing to unrelated sections of Harrison, in the context of verbatim copying Applicant's claim language. None of the sections of Harrison cited by the examiner, or any other section of Harrison, can be argued under any stretch of logic as teaching propagation channel adjustment responsive to determining dummy signal interference.

C. <u>The examiner misconstrues claim terms.</u>

1. The examiner misconstrues the term "information signal."

All independent claims in the instant application include limitations to a transmitted "information signal." As would be understood by one skilled in the art, the term "information signal" connotes modulated symbol data, and that understanding is supported by the specification at p. 8, lines 13-22; see, especially, Eq. 2 on p. 8.

The examiner's rejection arguments of all independent claims depend on his assertion that a "channel impulse response" is the same as the claimed information signal. Final Office Action, p. 3, ¶ 5.

A channel impulse response is a physical characteristic of a propagation channel—i.e., attenuation, phase shift, fading, etc.—and per se cannot be transmitted. Construing the claimed information signal to be a channel impulse response is an unreasonably broad interpretation of the term, in that such construction is inconsistent with the meaning one of ordinary skill in the art would assign, and is inconsistent with the specification.

2. The examiner misconstrues the term "dummy signal."

All independent claims in the instant application include limitations to a transmitted "dummy signal" that is pre-filtered using propagation channel estimates. Specifically, claims 1 and 29 use the term "dummy pilot signal," and claim 21 uses the equivalent term "dummy signal." The claims and the specification make clear that the term "dummy pilot signal," and the

equivalent term "dummy signal," denote an extra signal transmitted to an imaginary (non-existent) receiver for the purpose of better characterizing propagation channels between a number of transmitters and a lesser number of receivers. See the instant application at, for example, p. 3, lines 7-12, and at p. 17, line 21 – p. 19, line 13.

The examiner's rejection arguments of all independent claims depend on his assertion that Harrison's "synthesized pilot" is the same as the claimed information signal. Final Office Action, p. 4, ¶ 1. As detailed earlier herein, the "synthesized pilot" of Harrison is not a transmitted signal at all, and thus cannot be understood to be equivalent to the claimed dummy signal. Further, Harrison's synthesized pilot is not an "extra" signal of any kind; rather it is a composite channel estimate and it is nonsensical to argue that it is a transmitted dummy signal intended to support channel estimation as detailed in the claims and specification of the instant application.

By interpreting the claimed dummy signal to mean Harrison's non-transmitted synthesized pilot signal, the examiner gives the claimed term an unreasonably broad construction that is inconsistent with the meaning one of ordinary skill in the art would assign, and inconsistent with the instant specification.

D. <u>Harrison does not anticipate claims 1-5 and 7-9.</u>

1. Harrison does not anticipate claim 1, or any of its dependents.

Claim 1 includes the limitation of "transmitting information signals for said receivers jointly from said two or more transmitters, said information signals pre-filtered based on propagation channel estimates." The examiner states that Harrison anticipates this limitation by teaching the joint transmission of a "channel impulse response" from two or more antenna elements (of Harrison's adaptive antenna array 302), to some lesser number of Harrison's subscriber units. Final Office Action, p. 3, ¶ 5 – p. 4, ¶ 1.

The examiner specifically refers to col. 6, line 65 – col. 3, line 27, of Harrison, and to Figs. 1 and 3 of Harrison, in support of this rejection. None of these sections or drawings teach,

suggest, or even hint at the examiner's rejection argument. For this reason alone, the Board should reverse the examiner's rejections of claims 1-9.

Claim 1 includes the further limitation of "transmitting at least one dummy pilot signal jointly from said transmitters, said at least one dummy pilot signal pre-filtered based on said propagation channel estimates." The examiner argues that Harrison teaches jointly transmitting a synthesized pilot, which he equates with the claimed dummy signal, after pre-filtering the synthesized pilot using propagation channel estimates. Final Office Action, p. 4, ¶ 1.

Specifically, the examiner refers to Fig. 1 of Harrison, and to col. 4, lines 14-21, of Harrison, for the proposition that Harrison teaches jointly transmitting a pre-filtered synthesized pilot. Fig. 1 plainly illustrates non-joint, non-dummy per-element pilot transmission, and mathematical derivation of the non-transmitted synthesized pilot—which is not a "signal" at all, but rather a composite channel estimate. The specification sections of Harrison referred to the by the examiner do not support his rejection proposition—indeed, they contradict it. For this reason alone, the Board should reverse the examiner's rejections of claims 1-9.

Claim 1 includes the further limitation of "receiving loop back signals from said receivers having dummy pilot signal interference that is dependent on the accuracy of said propagation channel estimates." The examiner states that Harrison teaches receiving loop back signals having dummy signal interference in them, and he specifically refers to Harrison at col. 3, lines 11-27, in support of that proposition. Final Office Action, p. 4, ¶ 2. The cited section of Harrison plainly does not support the examiner's rejection arguments, because it simply does not teach what the examiner asserts—in fact, it says nothing about loop back signals, dummy signals, or determining interference. For this reason alone, the Board should reverse the examiner's rejections of claims 1-9.

Claim 1 includes the further limitation of "revising said propagation channel estimates based on said loop back signals." The examiner states that Harrison teaches this limitation at col. 4, lines 60-67. Final Office Action, p. 4, ¶ 3. Specifically, the examiner states that Harrison

teaches "revising said propagation channel estimates based on said loop back signals (see col. 4, lines 60-67), where the channel is adaptively adjusted based on the signal weight of the traffic channel pilot."

First, one does not adapt the "channel"; rather, one adapts to the changing (propagation) channel. Second, there is no "traffic channel pilot" in Harrison. Third, there are no loop back signals in Harrison and, thus, no revision of propagation channel estimates based on loop back signals. Thus, Harrison does not teach revising propagation channel estimates responsive to loop back signals, and for this reason alone the Board should reverse the examiner's rejections of claims 1-9.

2. Harrison does not anticipate the further limitations of claim 2.

Claim 2 includes the limitations of "correlating said loop back signals with said information signals to determine an amount of dummy pilot signal interference," and "adjusting said propagation channel estimates to reduce said dummy pilot signal interference in said loop back signals." The examiner argues that Harrison teaches these limitations. Final Office Action, p. 4, ¶ 4 (citing to Harrison at col. 3, lines 1-27; col. 5, lines 24-32; col. 6, lines 22-29 and 49-64; and Figs. 1 and 4).

None of the cited passages, nor any other section of Harrison, teach, suggest, or even hint at the claim limitation in question. For this reason, the Board should reverse the examiner's rejection of claim 2.

3. Harrison does not anticipate the further limitations of claim 3.

Claim 3 includes the limitation of "determining a supplemental channel estimate vector for each one of said at least one dummy pilot signal, such that said supplemental channel estimate vectors are orthogonal to said channel estimate vectors." The examiner argues that Harrison anticipates this claim, based on observing that Harrison teaches that synthesized pilot formation involves the use of a "correlated vector in which eigenvectors are orthogonal." Final Office Action, p. 5, ¶ 1.

The point of claim 3 is determining an extra (supplemental) channel estimate vector that is orthogonal to the full set of channel estimate vectors determined for each of the actual receivers being transmitted to. Harrison discloses transmitting an orthogonal element pilot from each element in an adaptive antenna array—Harrison, col. 2, lines 41-64. The orthogonal vectors in Harrison specifically called out by the examiner represent the eigenvector corresponding to the maximum eigenvalue of the channel impulse response sample autocorrelation matrix, R_A. Harrison, col. 3, lines 50-67.

That autocorrelation matrix is not a matrix of channel estimate vectors and, more importantly, Harrison does not teach "determining a supplemental channel estimate vector (for an imaginary receiving) that is orthogonal to the channel estimate vectors of the actual receivers. As such, Harrison cannot anticipate claim 3, and the Board should reverse the examiner's rejection of claim 3.

4. Harrison does not anticipate the further limitations of claims 4 and 9.

Claims 4 and 9 include the limitation of pre-filtering the dummy pilot signal using propagation channel estimates. The examiner argues that Harrison teaches the limitations of claims 4 and 9. Final Office Action, p. 5, ¶ 2; p. 6 ¶ 3. As to claim 4, the examiner specifically argues that Harrison teaches that "the synthesized pilot and the associated vector is used [sic] for recalculation of the estimated measurements for pre-filtering the propagation of the channel [sic]."

The sections of Harrison cited to by the examiner teach the use of synthesized pilot information to refine channel weightings used by Harrison's base transceiver in the transmission of traffic channel signals. These operations are not, however, anticipating with respect to claims 4 and 9, because it is readily apparent from even a cursory reading of Harrison that the synthesized pilot is a non-transmitted set of mathematically derived values determined from individually transmitted element pilot signals that are not pre-filtered using channel propagation

estimates or anything else. For these reasons, the Board should reverse the rejections of claims 4 and 9.

E. Harrison does not anticipate claims 21 and 23-29.

1. Harrison does not anticipate claim 21, or any of its dependents.

Claim 21 includes the limitation of "a transmit processor operative to form a number of transmit signals as weighted combinations of at least one individual information signals and at least one dummy signal by pre-filtering the information signals and the at least one dummy signal using propagation channel estimates." The examiner argues that the claimed transmit processor is "inherent" in Harrison, and that Harrison teaches forming weighted combinations of information and dummy signals, wherein the dummy signals are pre-filtered using propagation channel estimates. Final Office Action, p. 6, ¶ 5.

The examiner refers to Harrison at col. 2, lines 45-48, col. 2, line 65 – col. 3, line 17, and to Figs. 1 and 5, of Harrison, in support of his anticipation argument. The cited sections of Harrison's specification discuss per-element pilot transmission from adaptive antenna array elements and the calculation of adaptive antenna array weights based on individual channel impulse responses determined from the element pilots. Fig. 1 specifically illustrates per-element pilot transmission, and adaptive weight synthesis based on per element pilots, and Fig. 5 illustrates non-weighted, non-pre-filtered element pilot transmissions—Fig. 5 makes clear that weighting is applied only to traffic channel signals, not to any pilots, and not to any dummy signals. The examiner's rejection arguments thus are wholly unsupported by Harrison, and the Board should reverse the examiner's rejections of claim 21 and its dependents for this reason alone.

Claim 21 includes the further limitation of "a loop back signal processor operative to determine interference at one or more wireless receivers receiving said transmit signals caused by transmission of said at least one dummy signal based on receiving loop back signals from the one or more wireless receivers." The examiner argues that the claimed loop back signal

processor is "inherent" in Harrison because Harrison's subscriber units provide feedback, and that Harrison specifically teaches determining interference at subscriber units arising from dummy signal transmission. Final Office Action, p. 7, ¶ 2.

For support of this proposition, the examiner refers to Harrison at col. 3, lines 1-27, col. 5, lines 24-31, and col. 6, lines 49-64. These sections of Harrison disclose that the individual channel impulse responses are determinable from the per-element pilots transmitted from Harrison's adaptive antenna array, and that the subscriber units 200 may transmit individual channel impulse response vectors or related traffic channel error rate information back to the base transceiver 300 for traffic channel weight adaptation. None of these sections have anything to do with determining dummy signal interference in a loop back signal, and the Board should reverse the examiner's rejections of claim 21 and its dependents for this reason alone.

Claim 21 includes the further limitation that "said transmit processor adjusts said propagation channel estimates to reduce interference caused by transmitting said at least one dummy signal based on said determined interference." The examiner asserts that the claimed transmit processor would be "inherent" in Harrison, and that Harrison actually discloses the adjustment of propagation channel estimates to reduce dummy signal interference. Final Office Action, p. 7, ¶ 3.

No section of Harrison supports the examiner's proposition. Indeed, Harrison in its entirety offers no teachings, suggestions, or even hints regarding the use of dummy signals, or the associated determination of dummy signal interference in receiver loop back signals. Harrison simply teaches that individual subscriber units 200 return individual channel impulse response vectors, composite channel weighting information determined from such vectors, or surrogate information related to such vectors, such as traffic channel error rate information. None of this feedback is dependent on, or related to, dummy signals, and none of this feedback is assessed for dummy signal interference. For these reasons alone, the Board should reverse the examiner's rejection of claim 21 and its dependent claims.

2. *Harrison does not anticipate claim 23.*

Claim 23 depends from claim 21 and includes the limitation that the "transmitters" of claim 21 "comprise a number of radio base stations." The examiner improperly uses an obviousness argument to hold claim 23 as anticipated by Harrison. Final Office Action, p. 7, ¶ 4, and the anticipation rejection of claim 23 should be reversed for this reason alone.

Moreover, a careful reading of the examiner's rejection arguments reveals that his premise is that it would be obvious to substitute radio base stations for the individual transmit elements of Harrison's adaptive antenna array 302. Specifically, the examiner's rejection arguments directly and indirectly equate Applicant's claimed transmitters with Harrison's adaptive antenna array. For examples, see, Final Office Action, p. 3, ¶ ¶ 5, 6; p. 4, ¶ 1; p. 5, ¶ ¶ 3, 4; and p. 7, ¶ 1.

It is nonsensical for the examiner to argue that it would be obvious to substitute geographically disperse, independent radio base stations for the individual antenna elements of Harrison's adaptive antenna array.

3. *Harrison does not anticipate claim 25.*

Claim 25 depends from claim 21, and includes the further limitation of the claimed transmit processor being operative to "form said channel estimate matrix as a channel estimate vector for each of the at least one information signals, and a channel estimate vector for each one of the at least dummy signal," and "wherein the channel estimate vectors for the information signals characterize actual propagation channels from each transmitter to a wireless receiver for which the information signal is intended." The instant application includes corresponding supporting details at p. 21, line 21 – p. 23, line 8, for example.

The examiner's argument that Harrison anticipates claim 25 amounts to nothing more than block copying the claim language at issue, and then generally asserting that the channel impulse response estimation taught by Harrison allows weighting vector calculation (pilot

synthesis), reflecting the composite channel between a given subscriber unit and the base transceiver. Final Office Action, p. 7 ¶ 6 – p. 8, ¶ 1.

Put more plainly, the examiner's 102 rejection of claim 25 uses Applicant's claim language but explains an operation of Harrison that is unrelated to the claimed limitations. For example, the examiner cites to Harrison at col. 3, lines 1-10; col. 3, line 42 – col. 4, line 17; col. 4, lines 63-67; col. 5, lines 31-40; and col. 6, lines 10-36. Final Office Action, p. 8, ¶ 1. Not a single one of these sections of Harrison, nor any other section of Harrison, describes forming a channel estimate vector for a dummy signal, and the Board should reverse the examiner's rejection of claim 25.

4. Harrison does not anticipate claim 26.

Claim 26 depends from claim 21, and includes the further limitation of the claimed transmit processor being further "operative to form the channel estimate vectors for the at least one dummy signal orthogonal to the channel estimate vectors for the one or more information signals, such that if the channel estimate vectors for the information signals substantially match the actual propagation channels, the at least one dummy signal will cancel at each wireless receiver receiving the transmit signals." See p. 23, lines 4-24, of the instant application for an example of this claimed limitation.

The examiner's argument that Harrison anticipates claim 26 again amounts to the examiner block copying Applicant's claim language, citing irrelevant sections of Harrison, and then reciting an operation of Harrison that, accurate or not, has nothing to do with the actual claimed limitation. Final Office Action, p. 8, ¶ 2. For this reason alone, the Board should reverse the examiner's rejection of claim 26.

In particular, the rejection of claim 26 is based on the examiner's assertion that Harrison teaches that the synthesized pilot "cancels noise at the associated receiver in which eigenvectors are orthogonal." Final Office Action, p. 8 ¶ 2. It is hard to say precisely what the

examiner means by this statement, but, whatever he means, it is not a proposition that has anything to do with anticipating claim 26.

First, the dummy signal of claim 26 does not cancel "noise" at remote receivers. The dummy signal itself will cancel out at each receiver to the extent that the network's aggregate propagation channel estimates between all transmitters and all receivers is accurate. Second, Harrison's synthesized pilot does not cancel noise, nor does it cancel interference. In Harrison, the base transceiver 300 transmits preferably orthogonal element pilots from each element of an adaptive antenna array. The use of orthogonal element pilots is desirable because it reduces or eliminates interference between the element pilots—i.e., it allows each subscriber unit 200 to discern the individual element pilots even though they all are received together as a composite signal.

By discerning individual element pilots, each subscriber unit 200 is able to estimate the channel impulse responses between each element of the adaptive antenna array 302 and itself, and feed this information, or some related information, back to the base transceiver 300. The eigenvectors called out by the examiner are explained in Harrison at col. 3, line 42 – col. 4, line 13, and they have nothing to do with canceling "noise," nor with the claimed limitation.

5. Harrison does not anticipate claim 28.

Claim 28 depends from claim 21, and includes the further limitation of the loop back processor being "operative to determine said interference at said receivers by correlating said loop back signals with said dummy signals and said information signals." The instant application provides example details corresponding to the claimed limitation in Fig. 3; at p. 4, lines 9-13; and at p. 18, line 14 – p. 19, line 13.

As argued repeatedly herein, Harrison does not disclose the transmission of a dummy signal, and thus cannot anticipate loop back processing involving that dummy signal. The examiner's arguments supporting his anticipation rejection of claim 28 simply state that loop back signal processing in the manner claimed would be inherent in Harrison. Final Office

Action, p. 8, ¶ 4 – p. 9, ¶ 1. The examiner's anticipation argument is wholly unsupported by the disclosure of Harrison, and the Board should reverse the examiner's rejection of claim 28.

6. Harrison does not anticipate claim 29.

Claim 29 includes the limitation of "a loop back signal processor to determine interference in a loop back signal from a wireless receiver caused by a dummy pilot signal being transmitted by said transmitters." The examiner states that the claimed loop back processor is "inherent" in Harrison. Specifically, the examiner states that Harrison teaches the claim limitation at col. 3, lines 1-27, col. 5, lines 24-31, and col. 6, lines 49-64, in support of that proposition. Final Office Action, p. 9, ¶ 3. None of the sections cited by the examiner, nor any other section of Harrison, describes the claimed loop back processor, loop back signal processing, nor any determination of dummy signal interference (or any interference) in loop back signals from receivers receiving a transmitted dummy signal. Because the examiner's rejection arguments are wholly unsupported by the disclosure of Harrison, the Board should reverse the examiner's rejection of claim 29.

Claim 29 includes the further limitation of "a transmit processor to adjust a transmit pre-filter being applied by said transmit processor to an information signal for the wireless receiver, and being applied to said dummy pilot signal, based on said determined interference." The examiner states that the claimed transmit processor is "inherent" in Harrison. Final Office Action, p. 9, ¶ 4. The examiner refers to Harrison at col. 3, lines 1-27, col. 4, lines 18-37, and lines 61-67, and to Fig. 1 of Harrison, as supporting the proposition that Harrison discloses the claimed transmit processor. These sections disclose the estimation of individual channel impulse responses using the per-element pilot signals transmitted from each element of Harrison's adaptive antenna array 302, the generation of a synthesized pilot from the individual channel impulse response estimates as a mathematical representation of the composite channel, and the use of the synthesized pilot in forming traffic channel weights.

None of these points has anything to do with adjusting a transmit pre-filter being applied to a dummy signal responsive to (dummy signal) interference determination. For this reason alone, the Board should reverse the examiner's rejection of claim 29.

Claim 29 includes the further limitation of "said loop back signal processor and said transmit processor cooperate to make propagation channel estimates on which said transmit pre-filter is based substantially match actual propagation channel characteristics between said transmitters and the wireless receiver by adjusting said propagation channel estimates to reduce said determined interference." The examiner again argues that the claimed loop back and transmit processors are inherent in Harrison, and argues that Harrison teaches the claimed limitation at col. 3, lines 1-27, col. 4, lines 14-29, col. 5, lines 24-32, col. 6, lines 22-29 and 49-64, and in Figs. 1 and 4. Final Office Action, p. 9, ¶ 5. None of these sections even come close to teaching what the examiner alleges.

Harrison teaches receiving composite channel impulse response vectors from individual subscriber units—see, e.g., Harrison at col. 3, lines 24-27—or receiving individual channel impulse response vectors from the subscriber units—see, e.g., Harrison at col. 6, lines 58-64—as a basis for calculating the composite channel impulse response vectors relating Harrison's adaptive antenna array 302 to each subscriber unit 200. Harrison also teaches generating adaptive weights for pre-filtering traffic channel signals—see Fig. 5, illustrating filters 304 being used to apply adaptive weights to traffic channel signal, see also the corresponding text in cols. 6 and 7 of Harrison.

Because the rejection of claim 29 is based on gross mischaracterizations of Harrison, and because even a cursory reading of Harrison reveals that the examiner's rejection arguments against claim 29 are wholly unsupported, the Board should reverse the examiner's rejection of claim 29.

F. **Harrison does not make claims 6 and 22 obvious.**

The examiner rejects claims 6 and 22 under 35 U.S.C. § 103(a) as being obvious over Harrison, in view of U.S. 6,144,711 to Raleigh et al. (hereinafter "Raleigh"). The examiner's obviousness arguments against these claims depend on the same erroneous assertions and technical misstatements regarding Harrison as are relied on in his legally unsupportable anticipation rejection of claims 1 and 21 over Harrison.

Claim 6 includes the limitation of transmitting an information signal for one receiver jointly from two transmitters by "transmitting the information signal on two transmit polarizations, wherein each said polarization propagates through a different propagation channel to said receiver." The examiner's obviousness rejections of these two claims acknowledges that Harrison does not teach the polarized transmission, but advances the argument that such transmissions are well known, as exemplified by Raleigh. Final Office Action, p. 10, ¶ 4. Claim 22 includes essentially the same polarized transmission limitation as claim 6, and the examiner's arguments against claim 22 essentially are the same. Final Office Action, p. 11, ¶ ¶ 1, 2, 3.

Specifically regarding claim 6, the examiner cites col. 7, lines 36-49, of Raleigh, and Fig. 5 of Raleigh, as supporting his assertion that polarized transmissions are well known, and that the use of polarized transmissions in Harrison would have been obvious. It strikes Applicant as a misunderstanding of Harrison, or a misunderstanding of the law of obviousness, to advance such an argument. It would not have been obvious to combine Raleigh with Harrison.

To wit, Harrison teaches the estimation of individual (different) radio channel propagation paths between individual elements of an antenna array and respective ones in a group of subscriber units. That is, by transmitting a uniquely identifiable element pilot from each antenna element, the individual subscriber units can discern which pilot was transmitted from which element, and estimate the radio channel relative to that element.

Raleigh uses polarization to gain additional (different) propagation paths. Raleigh, col. 7, lines 40-46. Specifically, Raleigh states that additional advantages can be gained if there are multiple polarizations, or if there are multiple propagation paths. In other words, Raleigh plainly states that one may gain an advantage by having multiple propagation paths, or by having multiple polarizations.

Because Harrison already teaches that its element pilots allow the subscriber units to identify and characterize the multiple propagation paths between its multiple antenna array elements and the individual subscriber units, the skilled person reading Raleigh would not understand Harrison as benefiting in any way from the use Raleigh as suggesting that multiple polarizations be used in a system already benefiting from multiple propagation paths.

With no motivation to combine Raleigh with Harrison, and with the plain technical inappropriateness of adding Raleigh's transmit polarizations to the antenna array of Harrison, the examiner's obviousness arguments against claim 6 fail as a matter of law.

VIII. CLAIMS APPENDIX

The following claims are on appeal:

1. A method of estimating propagation channels between two or more transmitters and a fewer number of receivers, the method comprising:

transmitting information signals for said receivers jointly from said two or more transmitters, said information signals pre-filtered based on propagation channel estimates;

transmitting at least one dummy pilot signal jointly from said transmitters, said at least one dummy pilot signal pre-filtered based on said propagation channel estimates; and

receiving loop back signals from said receivers having dummy pilot signal interference that is dependent on the accuracy of said propagation channel estimates; and

revising said propagation channel estimates based on said loop back signals.

2. The method of claim 1 wherein revising said propagation channel estimates based on said loop back signals comprises:

correlating said loop back signals with said information signals to determine an amount of dummy pilot signal interference; and

adjusting said propagation channel estimates to reduce said dummy pilot signal interference in said loop back signals.

3. The method of claim 1 wherein said propagation channel estimates comprise propagation channel estimate vectors relating each said receiver to said transmitters, and further comprising determining a supplemental channel estimate vector for each one of said at least one dummy pilot signal, such that said supplemental channel estimate vectors are orthogonal to said channel estimate vectors.

4. The method of claim 3 wherein pre-filtering said at least one dummy pilot signal based on said propagation channel estimates comprises pre-filtering said at least one dummy pilot signal using said supplemental channel estimate vector.

5. The method of claim 1 wherein transmitting information signals for said receivers jointly from said transmitters comprises transmitting an information signal for one receiver jointly from two transmitters.

6. The method of claim 5 wherein transmitting an information signal for one receiver jointly from two transmitters comprises transmitting the information signal on two transmit

polarizations, wherein each said polarization propagates through a different propagation channel to said receiver.

7. The method of claim 1 wherein transmitting information signals for said receivers jointly from said transmitters comprises transmitting a combination of information signals for a first plurality of receivers from each one in a larger plurality of transmitters.

8. The method of claim 7 wherein said transmitters are radio base stations, and wherein comprises pre-filtering said information signals to form a combined transmit signal for each one of said transmitters, said combined transmit signals representing differently weighted combinations of said information signals based on said pre-filtering using said propagation channel estimates.

9. The method of claim 8 further comprising pre-filtering said at least one dummy pilot signal, such that said combined transmit signals further comprise a weighted version of said at least one dummy pilot signal.

21. A wireless communication network comprising:

a transmit processor operative to form a number of transmit signals as weighted combinations of at least one individual information signals and at least one dummy signal by pre-filtering the information signals and the at least one dummy signal using propagation channel estimates;

a number of transmitters operative to transmit said transmit signals;

a loop back signal processor operative to determine interference at one or more wireless receivers receiving said transmit signals caused by transmission of said at least

one dummy signal based on receiving loop back signals from the one or more wireless receivers;

wherein said transmit processor adjusts said propagation channel estimates to reduce interference caused by transmitting said at least one dummy signal based on said determined interference.

22. The wireless communication network of claim 21 wherein said transmitters comprise a number of antenna elements on a transmitting antenna, at least one of said antenna elements having a different polarization than another antenna element.

23. The wireless communication network of claim 21 wherein said transmitters comprise a number of radio base stations.

24. The wireless communication network of claim 21 wherein said transmit processor is further operative to form a channel estimate matrix comprising the propagation channel estimates.

25. The wireless communication network of claim 24 wherein said transmit processor is further operative to form said channel estimate matrix as a channel estimate vector for each of the at least one information signals, and a channel estimate vector for each one of the at least dummy signal, wherein the channel estimate vectors for the information signals characterize actual propagation channels from each transmitter to a wireless receiver for which the information signal is intended.

26. The wireless communication network of claim 25 wherein the transmit processor is further operative to form the channel estimate vectors for the at least one dummy signal

orthogonal to the channel estimate vectors for the one or more information signals, such that if the channel estimate vectors for the information signals substantially match the actual propagation channels, the at least one dummy signal will cancel at each wireless receiver receiving the transmit signals.

27. The wireless communication network of claim 21 wherein said transmit processor comprises one or more signal processors operative to perform said pre-filtering.

28. The wireless communication network of claim 21 wherein said loop back processor comprises one or more signal processor operative to determine said interference at said receivers by correlating said loop back signals with said dummy signals and said information signals.

29. A wireless network processing system in a wireless communication network wherein a number of transmitters jointly transmit to a lesser number of receivers, the wireless network processing system comprising:

a loop back signal processor to determine interference in a loop back signal from a wireless receiver caused by a dummy pilot signal being transmitted by said transmitters; and

a transmit processor to adjust a transmit pre-filter being applied by said transmit processor to an information signal for the wireless receiver, and being applied to said dummy pilot signal, based on said determined interference;

wherein said loop back signal processor and said transmit processor cooperate to make propagation channel estimates on which said transmit pre-filter is based substantially match actual propagation channel characteristics between said

transmitters and the wireless receiver by adjusting said propagation channel estimates to reduce said determined interference.

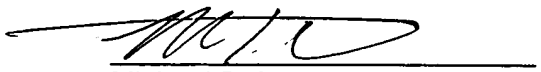
IX. CONCLUSION

The pattern adopted by the examiner in all of his rejections is one of verbatim copying Applicant's claim language, and then citing to sections of Harrison unrelated to the claim limitations in question, or simply misstating the teachings of Harrison. The examiner is obligated to establish a factual record supporting his claim rejections, and, in this case, the examiner's statements regarding the teachings of Harrison are so completely at odds with the actual teachings of Harrison that it is not an exaggeration to state that the prosecution record is devoid of any factual support for any of the claim rejections.

Respectfully, Applicant believes that the Board need do no more than read Harrison, and then read the examiner's Final Rejection, to conclude that the examiner misunderstands Harrison, misstates the teachings of Harrison, and misapplies the laws of anticipation and obviousness. Thus, for these reasons, and for all of the reasons given above, Applicant respectfully requests the Board to reverse the examiner on all outstanding rejections.

Respectfully submitted,

COATS & BENNETT, P.L.L.C.



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